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;*******************************************************************
;                                                                 *
;          PROGRAM ID:        SYSTEM BOOTSTRAP DRIVER             *
;                                                                 *
;*******************************************************************
;                                                                 *
;          PROPERTY OF:       JADE COMPUTER PRODUCTS              *
;                             4901 W. ROSECRANS BLVD.             *
;                             HAWTHORNE, CALIFORNIA               *
;                             90250,   U.S.A.                     *
;                                                                 *
;*******************************************************************
;                                                                 *
;          VERSION:           2.2                                 *
;                                                                 *
;*******************************************************************
; THE  SYSTEM BOOTSTRAP DRIVER IS ONE OF TWO MODULES             *
; THAT MAKE UP THE  SYSTEM  RESIDENT BOOTSTRAP. THIS             *
; MODULE IS TO BE EXECUTED BY  THE SYSTEM PROCESSOR.             *
; DURING EXECUTION, THIS MODULE PERFORMS A BLOCK MOVE            *
; OF THE SECOND MODULE  (BOOT INJECTION MODULE) INTO             *
; THE DOUBLE D CONTROLLER MEMORY.   A SUCCESSFUL BOOT            *
; OPERATION BY THE DOUBLE D WILL LEAVE DCM IN BANK 0             *
; AND BIOS IN  BANK 1.   THE REMAINDER OF THIS MODULE            *
; THEN MOVES THE  BIOS  IMAGE TO  THE  PROPER SYSTEM             *
; ADDRESS AND  JUMPS TO THE  BIOS COLD START ENTRY.              *
;************************************************** SK ***
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                         ;*******************************************************
                         ; DOUBLE D HARDWARE PARAMETERS.   PLEASE NOTE THIS      *
                         ; SECTION CONTAINS CONDITIONAL STATEMENTS.              *
                         ;*******************************************************

0043                     D.PORT    ==      043H      ;DOUBLE D PORT ADDRESS.
0001                     TRUE      ==      1         ;TRUE IS A ONE.
0000                     FALSE     ==      0         ;FALSE IS A ZERO.
0001                     REV.B     ==      TRUE      ;SET TRUE FOR REV B BOARDS.
0000                     REV.C     ==      FALSE     ;SET TRUE FOR REV C BOARDS.
0000                     MA10      ==      FALSE     ;TRUE IF MA10 JUMPED (REV-B).

                                   .IFG    REV.B, [
0002                     DS.HLT    ==      002H      ;STATUS PORT HALT INDICATOR.
000C                     DS.ASW    ==      00CH      ;STATUS PORT ADDR SW MASK.
E400                     D.BASE    =       0E400H    ;SYSTEM WINDOW BASE ADDRESS]

                                   .IFG    MA10, [
                         D.BASE    ==      0E000H    ;SYSTEM WINDOW BASE ADDRESS]

                                   .IFG    REV.C, [
                         DS.HLT    ==      001H      ;STATUS PORT HALT INDICATOR.
                         DS.ASW    ==      00EH      ;STATUS PORT ADDR SW MASK.
                         D.BASE    ==      0E000H    ;SYSTEM WINDOW BASE ADDRESS]

                         ;*******************************************************
                         ; BOOTSTRAP INJECTION MODULE PARAMETERS (ALTERABLE)    *
                         ;*******************************************************

0200                     IM.ADR    ==      0200H     ;BOOT INJECTION MODULE ADDRESS.
00C0                     IM.SZE    ==      00C0H     ;BOOT INJECTION MODULE SIZE.

                         ;*******************************************************
                         ; BOOTSTRAP LINKAGE ADDRESS.                           *
                         ;*******************************************************

0080                     BSTACK    ==      0080H     ;BOOTSTRAP TOP OF STACK.
0040                     D.ADDR    ==      0040H     ;DOUBLE D ADDRESS POINTER.
0377                     BL.DCS    ==      0377H     ;DCM DISK CONTROLLER STATUS.
0378                     BL.ADR    ==      0378H     ;DCM LOAD AND JUMP ADDRESS.
037A                     BL.BSZ    ==      037AH     ;DCM BLOCK LOAD SIZE.

                         ;*******************************************************
                         ; DOUBLE D HARDWARE COMMANDS                           *
                         ;*******************************************************

0080                     DC.BGN    ==      080H      ;RESET Z80A AND EXECUTE.
0001                     DC.MRQ    ==      001H      ;REQUEST MEMORY WINDOW.
0000                     DC.MRT    ==      000H      ;RELEASE MEMORY WINDOW.
0001                     DC.MB0    ==      001H      ;SELECT MEMORY BANK 0.
0003                     DC.MB1    ==      003H      ;SELECT MEMORY BANK 1.
0002                     DC.EXC    ==      002H      ;ISSUE DOUBLE D INTERRUPT.

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                      ;*******************************************************
                      ; ASSEMBLER DIRECTIVES                                 *
                      ;*******************************************************

                              .I8080              ;USE 8080 INSTRUCTION SUBSET.
                              .PABS               ;ASSEMBLE ABSOLUTE ADDRESS.
                              .PHEX               ;GENERATE INTEL HEX FORMAT.
                              .XLINK              ;SUPRESS LINKAGE OUTPUT.
    0100                      .LOC      0100H     ;MODULE ADDRESS (ALTERABLE).


                      ;*******************************************************
                      ; SET STACK AND CONTROLLER ADDRESS                     *
                      ;*******************************************************

    0100   31 0080    BEGIN:  LXI       SP,BSTACK    ;SET STACK POINTER.
    0103   DB43               IN        D.PORT       ;INPUT STATUS PORT.
    0105   E60C               ANI       DS.ASW       ;MASK FOR ADDR SWS.
    0107   07                 RLC                    ;POSITION BITS.
    0108   F6E4               ORI       D.BASE>8     ;OR IN BASE ADDR.
    010A   67                 MOV       H,A          ;HIGH BYTE VALUE.
    010B   2E00               MVI       L,0          ;LOW BYTE VALUE.
    010D   22 0040            SHLD      D.ADDR       ;STORE THE ADDRESS


                      ;*******************************************************
                      ; INJECT BOOT MODULE INTO CONTROLLER                   *
                      ;*******************************************************

    0110   3E01       INJECT: MVI       A,DC.MB0     ;REQUEST DD MEM BANK 0.
    0112   D343               OUT       D.PORT       ;ISSUE COMMAND.
    0114   01 00C0            LXI       B,IM.SZE     ;INJECTION SIZE.
    0117   EB                 XCHG                   ;D.ADDR HL TO DE.

    0118   21 0200            LXI       H,IM.ADR     ;INJECTION MODULE.
    011B   CD 0159            CALL      BLOCK        ;BLOCK MOVE.


                      ;*******************************************************
                      ; RESET AND START THE DISK PROCESSOR                   *
                      ;*******************************************************

    011E   3E80               MVI       A,DC.BGN     ;BEGIN DD PROCESSOR.
    0120   D343               OUT       D.PORT       ;ISSUE  COMMAND.
    0122   E3                 XTHL                   ;ALLOW DOUBLE D TIME
    0123   E3                 XTHL                   ;TO START UP.


                      ;*******************************************************
                      ; WAIT FOR TASK COMPLETION                             *
                      ;*******************************************************

    0124   DB43       WAIT:   IN        D.PORT       ;INPUT DD STATUS.
    0126   E602               ANI       DS.HLT       ;TEST HALT* STATUS.
    0128   C2 0124            JNZ       WAIT         ;WAIT TILL HALTED.
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                    ;**********************************************************
                    ; SWITCH CONTROLLER MEMORY INTO SYSTEM BUS                *
                    ;**********************************************************

012B    3E01              MVI     A,DC.MRQ        ;REQUEST MEM (BANK 0).
012D    D343              OUT     D.PORT          ;ISSUE COMMAND.


                    ;**********************************************************
                    ; CHECK FOR BOOTSTRAP MALFUNCTION                         *
                    ;**********************************************************

012F    2A 0040           LHLD    D.ADDR          ;CONTROLLER ADDRESS.
0132    11 0377           LXI     D,BL.DCS        ;ERROR CODE OFFSET.
0135    19                DAD     D               ;SET HL POINTER.
0136    7E                MOV     A,M             ;GET ERROR CODE.
0137    A7                ANA     A               ;TEST REGISTER.
0138    C2 0166           JNZ     BAD.LD          ;BAD LOAD.


                    ;**********************************************************
                    ; PERFORM BLOCK TRANSFER FROM DISK MEMORY                 *
                    ;**********************************************************

013B    2A 0040           LHLD    D.ADDR          ;CONTROLLER ADDRESS.
013E    11 0378           LXI     D,BL.ADR        ;LOAD ADDRESS PNTR.
0141    19                DAD     D               ;SET HL POINTER.
0142    5E                MOV     E,M             ;LOW ORDER ADDR.
0143    23                INX     H               ;INCREMENT HL.
0144    56                MOV     D,M             ;HIGH ORDER ADDR.
0145    23                INX     H               ;REQUIRES BL.BSZ NEXT.
0146    4E                MOV     C,M             ;LOW ORDER LENGTH.
0147    23                INX     H               ;INCREMENT HL.
0148    46                MOV     B,M             ;HIGH ORDER LENGTH.
0149    D5                PUSH    D               ;USE AS JUMP ADDR.
014A    3E03              MVI     A,DC.MB1        ;SWITCH TO MEM BANK 1.
014C    D343              OUT     D.PORT          ;ISSUE COMMAND.
014E    2A 0040           LHLD    D.ADDR          ;DOUBLE D MEM ADDRESS.
0151    CD 0159           CALL    BLOCK           ;MOVE BIOS MODULE.


                    ;**********************************************************
                    ; TRANSFER CONTROL TO OPERATING SYSTEM                    *
                    ;**********************************************************

0154    3E01              MVI     A,DC.MB0        ;SWITCH TO BANK.0
0156    D343              OUT     D.PORT          ;ISSUE COMMAND.
0158    C9                RET                     ;GOTO BIOS COLD ENTRY.
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                    ;*****************************************************************
                    ; BLOCK MOVE SUBROUTINE (Z80 BLOCK MOVE REGISTERS)       *
                    ;*****************************************************************

0159    7E          BLOCK:  MOV     A,M             ;GET BYTE.
015A    23                  INX     H               ;INC POINTER
015B    EB                  XCHG                    ;GET DESTINATION.
015C    77                  MOV     M,A             ;PUT BYTE.
015D    23                  INX     H               ;INC POINTER
015E    EB                  XCHG                    ;GET SOURCE.
015F    0B                  DCX     B               ;ONE LESS TO DO.
0160    78                  MOV     A,B             ;GET HI COUNT.
0161    B1                  ORA     C               ;GET LO COUNT.
0162    C2 0159             JNZ     BLOCK           ;FINISH LOADING.
0165    C9                  RET


                    ;*****************************************************************
                    ; ERROR HAS BEEN DETECTED                               *
                    ;*****************************************************************

0166    21 016D     BAD.LD: LXI     H,ER.MSG        ;ERROR MESSAGE
0169    CD 0196             CALL    MSG.OT          ;DISPLAY IT.
016C    76                  HLT                     ;HALT OR GOTO MONITOR.

016D    0D0A0A535953 ER.MSG: .ASCIS  [CR][LF][LF]"SYSTEM BOOT LOAD ERROR"

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                        ;********************************************************
                        ; CONSOLE LINKAGE DEFINITIONS                          *
                        ;********************************************************

0000                    CNO.SP   ==        000H     ;OUTPUT STATUS PORT.
0004                    CNO.SB   ==        004H     ;OUTPUT STATUS BIT.
0000                    CNO.SI   ==        000H     ;OUTPUT STATUS INVERT.
0001                    CNO.DP   ==        001H     ;OUTPUT DATA PORT.

000A                    LF       ===       00AH     ;ASCII LINE FEED
000D                    CR       ===       00DH     ;CARRAIGE RETURN

                        ;********************************************************
                        ; CONSOLE OUTPUT                                       *
                        ;********************************************************

0186    F5              CNS.OT:  PUSH      PSW      ;SAVE CHARACTER
0187    DB00            ..WAIT:  IN        CNO.SP   ;INPUT STATUS
0189    EE00                     XRI       CNO.SI   ;ADJUST POLARITY
018B    E604                     ANI       CNO.SB   ;MASK STATUS BIT
018D    CA 0187                  JZ        ..WAIT   ;TRY AGAIN
0190    F1                       POP       PSW      ;RESTORE CHARACTER
0191    E67F                     ANI       07FH     ;7 BIT ASCII
0193    D301                     OUT       CNO.DP   ;SEND CHARACTER
0195    C9                       RET

                        ;********************************************************
                        ; DISPLAY MESSAGE SUBROUTINE                           *
                        ;********************************************************

0196    F5              MSG.OT:  PUSH      PSW      ;SAVE CALLER FLAGS.
0197    7E              ..REPT:  MOV       A,M      ;LOAD CHARACTER.
0198    CD 0186                  CALL      CNS.OT   ;CONSOLE OUTPUT.
019B    7E                       MOV       A,M      ;SAME CAHRACTER.
019C    23                       INX       H        ;INCREMENT POINTER.
019D    E680                     ANI       080H     ;TEST SIGN BIT.
019F    CA 0197                  JZ        ..REPT   ;ANOTHER CHARACTER.
01A2    F1                       POP       PSW      ;RESTORE FLAGS.
01A3    C9                       RET                ;RETURN TO CALLER.

                        ;********************************************************

0100                             .END      BEGIN
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BAD.LD 0166          BEGIN  0100          BLOCK  0159          BL.ADR 0378
BL.BSZ 037A          BL.DCS 0377          BSTACK 0080          CNO.DP 0001
CNO.SB 0004          CNO.SI 0000          CNO.SP 0000          CNS.OT 0186
CR     000D          DC.BGN 0080          DC.EXC 0002          DC.MBO 0001
DC.MB1 0003          DC.MRQ 0001          DC.MRT 0000          DS.ASW 000C
DS.HLT 0002          D.ADDR 0040          D.BASE E400          D.PORT 0043
ER.MSG 016D          FALSE  0000          IM.ADR 0200          IM.SZE 00C0
INJECT 0110          LF     000A          MA10   0000          MSG.OT 0196
REV.B  0001          REV.C  0000          TRUE   0001          WAIT   0124
```